Andreas Gimsa

The Missing Element

$$t_{uni} = \sqrt{\frac{\hbar^3\, r_p}{c\, G^2\, {m_e}^2 {m_p}^3}}$$

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The structure of this publication is based on the following theses, which are discussed, mathematically described, and proven. Where possible, it is explained why the theses correspond with the observations.

Introduction

Why did I write this book? My original goal was to explain the phenomenon of time. In that context, I also considered it essential to integrate the concept of information and the conservation of information into the fundamentals of physics.

The Big Bang theory seemed unnatural to me, for how can everything arise from nothing? Einstein’s theory of gravity does not align with my conviction that an electromagnetic explanation of gravity must be possible using Maxwell’s equations.

Motivated by this, I formulated new physical equations to describe nature and conducted numerous theoretical and computational experiments. Over many years, these equations were compared with established physics and known experiments through trial and error and further refined. As a result, new physical insights are presented here that provide the key to a new understanding of the world. They have given me deep insights into the nature of the universe and will do the same for the reader. I have endeavored to write the book in such a way that a science student or high school graduate can understand it.

It has long been suspected that there is a so-called ether. To mathematically embed it within physics, the ether is described here within the framework of classical physics using a fifth spacetime dimension, which serves as a general reference frame for all objects contained within it.

The universe is explained as a spherical structure, and the correct spacetime equation is introduced.

It can be shown which physical quantities must change with the age of the universe.

Gravity is described based on an electromagnetic origin derived from Maxwell’s equations. Anyone who finds Einstein’s spacetime curvature baffling and insufficient as an explanation should read on here.

Readers should be prepared for a few surprises. This publication contains over 15 years evolutionary research in the field of physics. In the physics that describes the universe and gravity, no stone is left unturned. And the spectrum spans from macroscopic physics to quantum physics.

Who knows today that the age of the universe can easily be calculated from elementary quantities and physical constants using Equation (135)? [1]

This is my third science book on the universe. The first book is “The Beauty of Nature” from 2014, the second “The Metric of Spacetime” from 2020, and now “The Missing Element.” I have also published many articles. My previous publications contain not only many new and innovative ideas but also mistakes. These are so important to learn from them and ultimately drawing the right conclusions. Today I’m glad I made them, because they helped me move forward. In July 2025, I attended an entrepreneurship day in my hometown. There, a speaker drew attention to a German wordplay. The word “FEHLER” (mistake) contains the letters “HELFER” (helper). That hits the nail on the head—our mistakes are also our helpers. We should engage with them.

With a whopping 333 formulas, this book can certainly be called a formula collection. I read somewhere that many formulas scare readers away and lower book sales. Honestly, I don’t care. I have a deep need to share this knowledge with people who don’t have to be physicists or scientists.

I welcome constructive discussions and suggestions for improvement.

<u>Note</u>

In numerical representations, English notation is used with respect to periods and commas.

[1] Andreas Gimsa, The Metric of Spacetime, 2nd edition, Book on Demand GmbH, Hamburg, 2020, ISBN 978-3-00-064784-0, p. 84

1. The universe is spherical; its age is omnipresent

How could one prove that the universe is spherical? Its shape is difficult to measure, as it is vast in size and the distance from our galaxy to the edge of the universe is unknown.

An expansion of the universe is observed that proceeds uniformly when viewed from any location. The following section explains that this observation can be accounted for by a spherical universe whose center remains stationary and whose galaxies move faster the farther they are from the center. This goes so far that a galaxy located directly in front of the outer edge of the universe moves at nearly the speed of light. [2]

How is a sphere in space described mathematically? One way to represent it is the so-called spherical equation, which contains the three spatial coordinates x, y, z and its radius r. This is the set of points in three-dimensional space that are exactly at a distance r from the origin and describe a spherical surface:

$$x^2 + y^2 + z^2 = r^2 = c^2 {t_k}^2 \qquad (001)$$

Is it conceivable that the universe could be described by such an equation? This possibility exists, and it remains to be proven why the following spherical equation (002), with $c_i^2 = -c^2$, can be applied to the universe and the events occurring within it.

In this context, it should also be noted that although the universe has a very low average density (see also Table 2), it satisfies the condition: $R = GM/c^2$ for its radius, under which a black hole exists. This is half of the so-called Schwarzschild radius. The aim is to dispel the myth that black holes are extremely compact gravitational monsters. Figure 1 shows various black holes with masses ranging from $10^{25} kg$ to $10^{53}\ kg$. For a mass in the range of $M = 10^{40}\ kg$, their density is already lower than that of atmospheric air. It is interesting that all black holes possess the same surface-specific entropy. The surface is a measure of potential information: it can contain only as much information as there is space available on the surface.[3] This is a clear indication that all the information of the black hole is stored on its surface.

[2] Andreas Gimsa, The Great Fallacy of the Accelerated Expansion of the Universe, International Journal of Scientific Research and Management, Volume 10, Issue 03, March 2022, DOI: 10.18535/ijsrm/v10i3.aa01, p. 100

[3] Brian Greene, The Fabric of the Cosmos, 3rd edition, Goldmann Verlag, Munich, 2008, ISBN 978-3-442-15487-6, p. 537

The entropy of black holes remains constant throughout their evolution. To ensure that no exchange of energy or matter with the environment occurs, thereby maintaining entropy constancy, the radius of a black hole must change at the speed of light. From this, I derive the following interesting propositions: Over time, black holes are constantly growing or shrinking. A black hole has a minimum surface area large enough that all information encoded in its mass can also be stored on its surface. They cannot be heavier than their surface area allows. The information-theoretical description of mass is presented in Chapter 15. There, and in Chapter 10, it is shown that the variable mass of a black hole is derived solely from the evolution of its surface. Since the following constant holds for the volume, surface area A_O, and density ρ of a black hole: $3c^2 = \rho\, GA_O$, its density decreases with increasing surface area, as shown in Diagram 1.

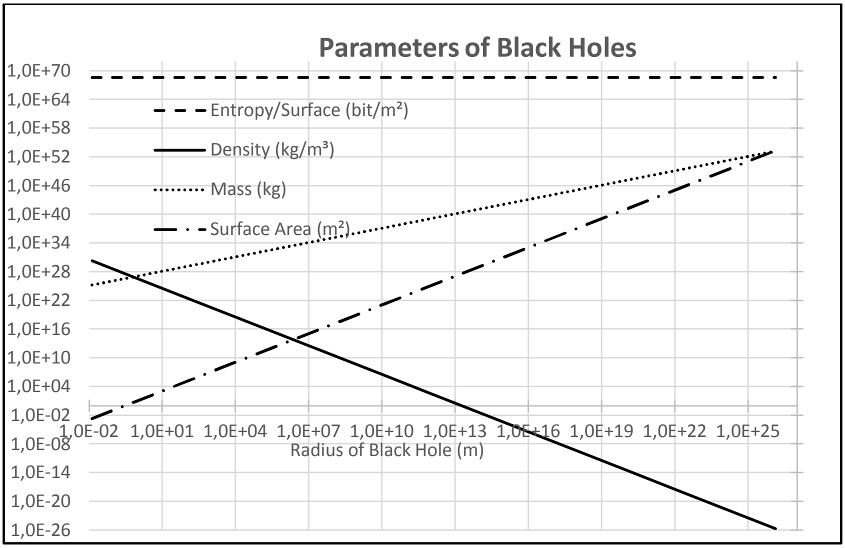

Figure 1: Possible parameters of black holes

2. The spacetime equation follows from spherical equation of universe

$$\boxed{x^2 + y^2 + z^2 = c^2 t_k^2 = c^2 {t_0}^2 - {c_i}^2 {t_i}^2 = c^2({t_0}^2 + t_i^2)} \qquad (002)$$

Equation (002), with its 5 terms, is another way of writing Equation (001). The square of an imaginary number is a negative number, and multiplying a negative number by a negative number yields a positive number. Therefore, the term ${c_i}^2 {t_i}^2$ is positive. The meaning of the imaginary speed of light c_i is explained in Chapter 3. The imaginary time t_i in Equation (002) is interpreted as the present. This must be omnipresent, i.e., the universe must be the same age when viewed from any location.

Equation (003) shows (002) with its 5 terms in differential notation: [4]

$$dx^2 + dy^2 + dz^2 = c^2 d{t_0}^2 - {c_i}^2 d{t_i}^2 \qquad (003)$$

I already described imaginary time t_i in connection with imaginary light c_i in the form of ether photons back in 2014.[5] There are already indications of the existence of imaginary time.[6] In general, however, time is still regarded today as real and one-dimensional.

From equations (002) and (003), both a spherical universe and the well-known event cones for causal and non-causal events can be mathematically derived. For this purpose, a complex two-dimensional time was introduced. However, complex time is present in every natural moving system. Since all objects in the universe are in motion, complex time t_k with its real t_0 and imaginary component t_i applies to all objects as well. The magnitude of complex time can be calculated as follows:

$$|t_k| = \sqrt{{t_0}^2 + {t_i}^2} = \sqrt{{t_0}^2 - {t_b}^2} \qquad (004)$$

The two components t_0 and t_i of complex time can be interpreted as two temporal dimensions. As described above, the imaginary component t_i is the present. As imaginary time, it is perpendicular to real time.

The mathematical structure of the spherical equation (002) allows for a pulsating universe without an inflationary phase.

The present of the universe t_i can also be defined for arbitrary event intervals.

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[4] Andreas Gimsa, The Metric of Spacetime, 2nd edition, Book on Demand GmbH, Hamburg, 2020, ISBN 978-3-00-064784-0, p. 8

[5] Andreas Gimsa, The Beauty of Nature, 2nd edition, Gieselmann Druck und Medienhaus, Potsdam, 2014, ISBN 978-3-923830-97-8, p. 28

[6] Stephen Hawking, A Brief History of Time: From the Big Bang to Black Holes, Bantam Books, New York, 1988, ISBN 978-0-553-10953-5

The time span t_b that elapses while an object is in motion corresponds to the magnitude of the complex time t_k.

As the object's velocity increases, the flow of time on the object is increasingly shifted from the real rest time t_0 into the present t_i. Accordingly, a reduced time span t_b applies. The imaginary time component t_i is not directly measurable, but it can be recognized by the reduced time span t_b at high object velocities. This is demonstrated below in the form of time dilation. For the square of the complex time ${t_k}^2$, the following expression applies:

$$ {t_k}^2 = {t_0}^2 + {t_i}^2 = {t_0}^2 - {t_b}^2 \qquad (005) $$

Equation (005) can be substituted into Equation (002). This yields the spacetime equation (006) with real terms:

$$ x^2 + y^2 + z^2 = c^2 {t_k}^2 = c^2({t_0}^2 - {t_b}^2) = {c_i}^2({t_b}^2 - {t_0}^2) $$

$$ \boxed{x^2 + y^2 + z^2 = c^2 {t_0}^2 - c^2 {t_b}^2} \qquad (006) $$

For the distance x, which can be traversed at the velocity v in the time t_0, the following can be written in one spatial direction using Equation (006):

$$ x^2 = v^2 {t_0}^2 = c^2 {t_0}^2 - c^2 {t_b}^2 \qquad \text{with} \quad y = z = 0 \qquad (007) $$

From this description, the correct formalism of time dilation can be derived, thereby demonstrating that it follows from the space-time equation and not, as is often mistakenly believed, from the Lorentz transformation.

$$ \boxed{v^2 {t_0}^2 + c^2 {t_b}^2 = c^2 {t_0}^2} \qquad (007a) $$

To be on the safe side, the quadratic equation (007) should also be checked using the so-called inverse Pythagorean $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{h^2}$ with the height h. In the right-angled triangle described by (007a), the height h can be easily calculated:

$$ h = \frac{v\, t_0\, c\, t_b}{c\, t_0} = v\, t_b \qquad (007b) $$

Now, using the square of the height $v^2\, {t_b}^2$ and the squares of the two legs $v^2 {t_0}^2$ and $c^2 {t_b}^2$, the inverse Pythagorean theorem holds:

$$ \boxed{\frac{1}{v^2 {t_0}^2} + \frac{1}{c^2 {t_b}^2} = \frac{1}{v^2 {t_b}^2}} \qquad (007c) $$

As with the parallel connection of ohmic resistors, equation (007c) can be rearranged into a different form:

$$ v^2 {t_b}^2 = \frac{v^2 {t_0}^2\; c^2 {t_b}^2}{v^2 {t_0}^2 + c^2 {t_b}^2} \qquad (007d) $$

Multiplying out equation (007d) yields the following expression:

$$v^2{t_b}^2v^2{t_0}^2 + v^2{t_b}^2c^2{t_b}^2 = v^2{t_0}^2\ c^2{t_b}^2 \tag{007e}$$

Equation (007e) is simplified, leaving the following expression:

$$v^2{t_0}^2 + c^2{t_b}^2 = c^2{t_0}^2 \tag{007f}$$

This corresponds again to equation (007a), from which time dilation follows directly. Equation (007c), which is as elegant as equation (007a), can therefore be applied.

What does equation (007c) tell us mathematically? It states that the distance-squared $v^2{t_b}^2$, which results from the velocity$v$ and the time interval t_b in the moving state of an object, must always be smaller than either of the two distance-squared terms $v^2{t_0}^2$ and $c^2{t_b}^2$, which result from the velocity$v$ and the rest time interval t_0, as well as the speed of light c and the time interval t_b. Here, the contraction of the ether with the object is already visible.

3. Time dilation follows from the spacetime equation

With a simple rearrangement, without the Lorentz transformation, equation (007) yields the reduced time interval t_b of the moving system relative to the time interval t_b of its own rest frame: [7]

$$t_b{}^2 = \frac{c^2 t_0{}^2 - v^2 t_0{}^2}{c^2} \quad \text{or} \quad t_b = t_0\sqrt{1 - \frac{v^2}{c^2}} \tag{008}$$

In a two-mass system in which both masses fall toward each other in free fall from an assumed state of rest and reach the final velocities v_1 and v_2 upon contact of their surfaces, the proper time intervals are reduced as follows:

$$t_{1b} = t_{10}\sqrt{1 - \frac{v_1{}^2}{c^2}} \quad \text{(008a)} \qquad \text{and} \qquad t_{2b} = t_{20}\sqrt{1 - \frac{v_2{}^2}{c^2}} \quad \text{(008b)}$$

Equation (008) could thus be derived by introducing complex time into the spacetime equation (002). A Lorentz transformation is not required. It is based on incorrect assumptions, since it ignores the velocity-dependent changes in the masses of the objects relative to their rest states.

Let us examine Equation (005) together with Equation (008). Here, another notation for complex time can be derived:

$$t_k{}^2 = t_0{}^2 - t_b{}^2 = t_0{}^2 - t_0{}^2\left(1 - \frac{v^2}{c^2}\right) = t_0{}^2\left[1 - \left(1 - \frac{v^2}{c^2}\right)\right] = t_0{}^2\frac{v^2}{c^2} \tag{008c}$$

If the object's velocity is $v = 0$, then the complex time is $t_k = 0$. If the object's velocity is theoretically $v = c$, then the complex time becomes $t_k = t_0$.

The shortened time interval t_b of a moving object relative to its state of rest t_0 in Equation (008) cannot be meaningfully applied in a relativistic analysis of two objects in different reference frames, whose roles are interchangeable.

If two objects move uniformly in opposite directions and have a certain relative velocity with respect to each other, it is in principle conceivable to assign the entire velocity to one object and consider the other object to be at rest. It would be equally conceivable to assign a certain portion of the velocity to one object.

[7] Andreas Gimsa, The Metric of Spacetime, 2nd edition, Book on Demand GmbH, Hamburg, 2020, ISBN 978-3-00-064784-0, p. 11